

# A NEW LUNG-WORM FROM AUSTRALIAN MARSUPIALS (Nematoda: Metastrongylidae)

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(With one Plate and six Text-figures.)

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A new Metastrongylid lung-worm has been found in two species of bandicoots. Five infected individuals of *Isoodon obesulus* (Shaw and Nodder) and one of *Perameles nasuta* Geoffroy were studied. In addition, specimens of the same parasite from *P. nasuta* were received from Mr. A. J. Bearup, School of Public Health and Tropical Medicine, Sydney.

In animals which were autopsied soon after capture, only small, inconspicuous, white nodules were present near the pleural surface of the lung. Within these nodules adult worms were found intricately embedded in the lung substance (Plate VI., fig. 1.) They proved very difficult to extract. However, one animal (*P. nasuta*) was kept in captivity for ten months, during which time it passed large numbers of first-stage larvae in its faeces. At autopsy its lungs were extensively mottled with greyish and white nodules. Many worms were embedded in these nodules, but others were lying more or less free in the bronchioles and extending for part of their length into the bronchi. They could with care be extracted intact. These worms were considered full-grown, being more than ten months old, and the measurements given below were made on them.

Worms were washed in 0.4 per cent. saline, killed with hot 70 per cent. alcohol, and stored in 70 per cent. alcohol containing 5 per cent. glycerine. Measurements of total length were made in the latter fluid; other measurements and photomicrographs were made from specimens cleared in lacto-phenol.

## DISTINCTIVE FEATURES.

This parasite may be readily distinguished from *Marsupostrongylus bronchialis* Mackerras and Sandars, from the same hosts. *M. bronchialis* is a much stouter worm which lives in the bronchi. It has a voluminous, strikingly ornamented teguminal sheath. The bursal formula is different, the lateral rays arising from a common base and the dorsals being reduced to papillae. The spicules are also distinct. The new species resembles *Plectostrongylus fragilis* Mackerras and Sandars, from the marsupial mouse, in general body form and location in the lung. However, *P. fragilis* is a smaller worm, distinguishable in the male by the bursa which has the same formula as *M. bronchialis*, and in the female by the sharply pointed tail and relatively muscular ovijector. The spicules are also quite distinct.

It seems better to make a new genus for this parasite rather than emend the definition of either of the above mentioned genera to include it. When our knowledge of the marsupial lung-worms is less fragmentary, it may be possible to reduce the number of genera. All three

species from Australian marsupials appear more closely related to each other than to the metastrongyles of the Eutheria, or to those of South American marsupials. They all possess tiny, delicate, complex spicules, which are equal in size and shape, and which split distally into long flexible rods clothed with membrane.

The generic name *Filostrongylus* is proposed, the name being referable to the extremely long, thread-like appearance of the worm. The specific name *peramelis* indicates the hosts, which belong to the family Peramelidae.

### **Filostrongylus** n.g.

Relatively smooth, thread-like worms. Male bursa with short, stumpy rays, ventrals arising separately, laterals also arising separately, externo-dorsal single, dorsals paired. Spicules complex, equal, each splitting distally into rods. Female without muscular ovijector, vulva close to posterior end, ovoviviparous.

### **Filostrongylus Peramelis** n.sp.

HOSTS: *Perameles nasuta* Geof. from Mt. Nebo, S.Q., and Sydney, N.S.W., and *Isoodon obesulus* (Shaw and Nodder) from Mt. Nebo and Mt. Glorious, S.Q.

HABITAT: Lung substance, bronchioles, bronchi.

TYPES: Holotype male and allotype female from *Perameles nasuta*, S.Q., in the collections of the Queensland Museum.

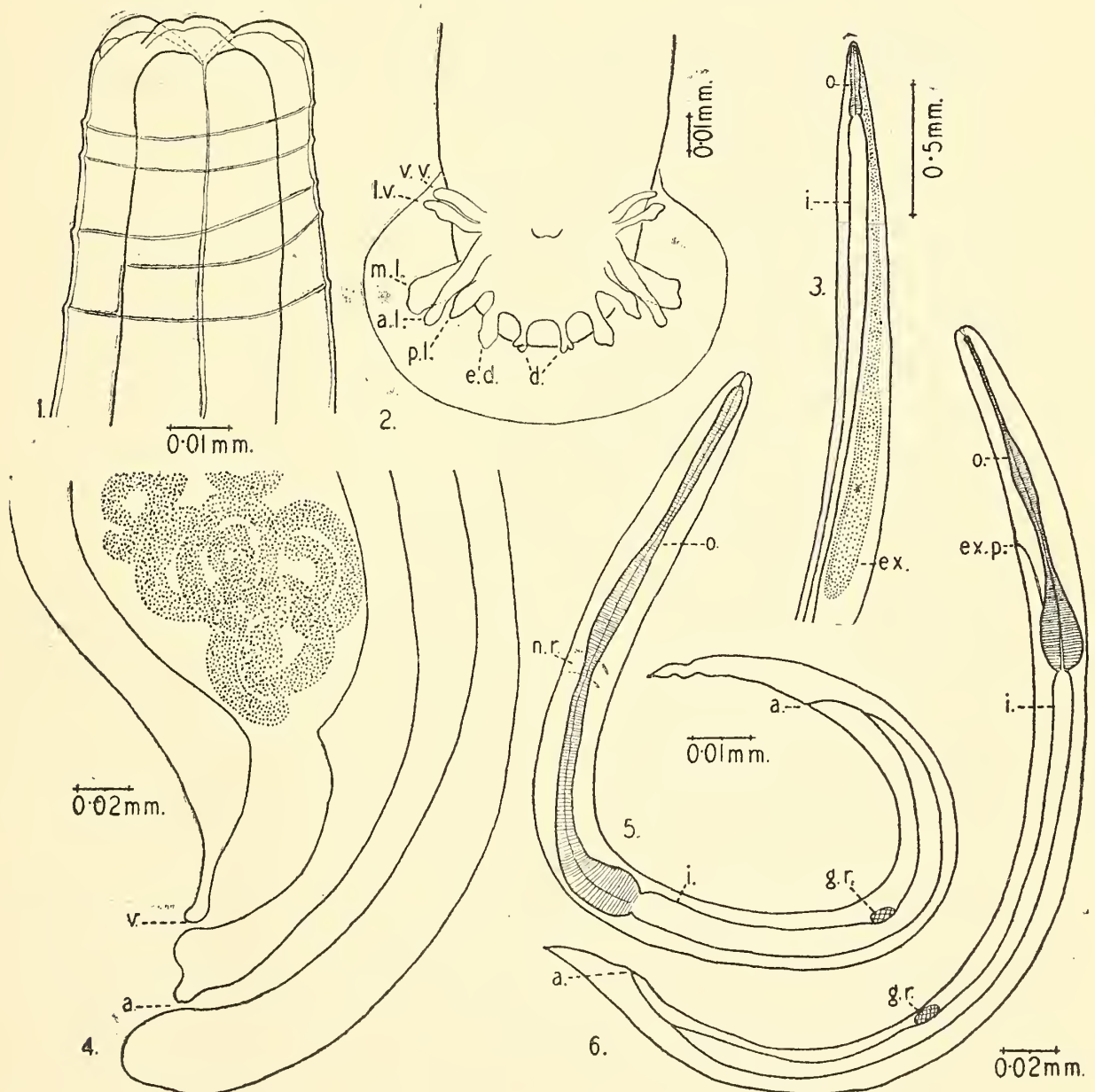
MALE: Long, delicate, filiform, tapering at each end, but otherwise nearly uniform in width. Cuticle with fine longitudinal striations; a series of irregular transverse wrinkles present in the oesophageal region (Text-fig. 1). Length, 35 to 49 mm., average of twelve specimens 44.5 mm. Diameter behind head 0.036 mm., at the oesophageal-intestinal junction 0.1 mm., maximum 0.24 mm., tapering to 0.06 mm. at cloaca. Nerve ring about 0.13 mm. from anterior end. The cuticle of the head is raised into three slightly bilobed lips. There are three rather squat papillae *en face*; two of them are shown in Text-fig. 1. Oesophagus 0.26 to 0.28 mm. in length by 0.05 mm. in maximum breadth. It is slightly constricted in the middle, and widest posteriorly. The intestine begins as a wide tube, containing pus cells and epithelial cells mixed with some red cells from the host; it gradually becomes narrower and pushed to one side, first by the excretory sac and then by the gonad. The excretory sac is about 3 mm. long; its opening could not be distinguished (Text-fig. 3).

Bursa small, rays short and stumpy. The ventrals are sub-equal, and lie closely approximated. The laterals arise separately; the antero-lateral and especially the medio-lateral have relatively broad bases, that of the former being medial and only slightly anterior to the latter. The antero-lateral usually lies obliquely across the broad medio-lateral, and projects as a finger-like process above and posterior to it. The postero-lateral is much shorter than the other two. The externo-dorsal is single, short and stumpy, sometimes ending in a papilliform projection. There are paired dorsal rays, each short and bifurcated (Text-fig. 2).

The spicules are tiny, delicate, complex structures. Each consists of a thin, curved, irregular plate, produced proximally into a roughened knob, and splitting distally into two long, flexible rods, of which the posterior is the longer. The ventral parts of the spicular plates are closely approximated (possibly fused) in the midline, and the ventral

plate so formed is produced distally into a median pointed piece, studded laterally with minute, short, blunt teeth. The tips of the long rods are clothed with membrane, and may sometimes be seen projecting through the cloaca. Posterior to the rods is a delicate gubernaculum shaped like a flattened gutter (Plate VI., figs. 2-4).

**FEMALE:** Length 65 to 92 mm., average of nine specimens 81 mm. Diameter just behind the head 0.05 mm., at the oesophageal-intestinal junction 0.14 to 0.19 mm., maximum 0.34 to 0.39 mm., tapering to 0.07 mm. at the vulva. In a specimen measuring 92 mm., the coils of the first ovary began about 3 to 4 mm. from the anterior end and those of the second ovary about 30 mm. from it. The greater part of the body is filled with the two uteri lying parallel with each other, each packed with ova containing well-developed embryos. The uteri unite 0.7 mm. from the vulva to form a common uterus, also packed with ova. This



Text-figures 1-6.—*Filostrongylus peramelis*, n.g., n.sp. 1. Head of male, showing lips, papillae, and transverse cuticular wrinkles; 2. Bursa of male; 3. Anterior end of male; 4. Posterior end of female; 5. First-stage larva; 6. Third-stage larva. a. anus, a.l. antero-lateral ray, d. dorsal rays, e.d. externo-dorsal ray, ex. excretory organ, ex.p. excretory pore, g.r. genital rudiment, i. intestine, l.v. latero-ventral ray; m.l. medio-lateral ray, n.r. nerve ring, o. oesophagus, p.l. postero-lateral ray, v. vulva, v.v. ventro-ventral ray.

is separated from the vagina by a slight constriction. The cuticle lining the vagina is continuous with the teguminal sheath. Tail short, bluntly rounded, anus 0.03 and vulva 0.06 to 0.09 mm. from the tip (Text-fig. 4). Other features as in the male.

### LIFE HISTORY.

**FIRST-STAGE LARVA:** Specimens from the uterus of the female measured 0.225 to 0.245 mm. in length by 0.011 mm. in width. There is a short oral cavity leading into a rhabitoid oesophagus measuring 0.1 mm. by 0.008 mm. at the bulb. Nerve ring 0.055 to 0.06 mm. and genital rudiment 0.144 mm. from the anterior end. Anus 0.03 mm. from posterior end. The tail is slender, pointed, and notched dorsally and ventrally (Text-fig. 5).

TABLE 1.

ATTEMPTS TO INFECT BANDICOOTS WITH *F. peramelis*.

Number of Recipient.	Date of Attempted Infection.	Dose of Larvæ.	Results.
360 .. ..	{ (1) 1-2-54 ..	10	-
	(2) 19-2-54 ..	32	
	(3) 23-4-54 ..	40	
362 .. ..	{ (1) 19-2-54 ..	45	+*
	(2) 30-4-54 ..	48	
364 .. ..	17-5-54 ..	54	+*
365 .. ..	25-5-54 ..	30	-
367 .. ..	{ (1) 26-10-54 ..	6	}
	(2) 1-11-54 ..	2	
	(3) 5-11-54 ..	12	

\* Infection died out in a few weeks.

First-stage larvae penetrated the foot of the small, dark, garden slug, *Agriolimax laevis* Muller, and went through developmental stages closely resembling those of other known lung-worms. The larvae became curled in a circle, and absorption of food material resulted in the intestinal cells becoming loaded with refractile granules. Full-growth first-stage larvae were about 0.4 mm. in length by 0.026 mm. in width. The first moult occurred in about two weeks, and the second about one week later. The third-stage larva remained within the two cast skins.

**THIRD-STAGE LARVA:** Length 0.45 mm. by 0.022 mm. in breadth. There is a short oral cavity leading into a rhabitoid oesophagus. There are two, rather delicate, chitinous rods with knobbed ends at the beginning of the oesophagus. The oesophageal bulb is well-developed, and appears dark by transmitted light. Oesophagus 0.135 mm. long by 0.015 mm. in maximum diameter. The excretory pore lies about 0.086 mm. and the genital rudiment 0.28 mm. from the anterior end. Tail 0.035 mm. long, sharply pointed.

It is unlikely that *Agriolimax laevis*, which is probably an introduced slug, is a natural host for this parasite. Many larvae failed to penetrate the slug, or, if they did, failed to reach third stage. Others succeeded in developing fully, but were rapidly walled around by fibroblasts and eventually absorbed. Many apparently normal third-stage larvae may not have been viable, as it proved difficult to set up new infections.

The slug infections were so light that it was never possible to get large numbers of larvae. Several attempts were made to transmit the infection by feeding third-stage larvae to *Isoodon obesulus*, which had been held in captivity for some months, and repeatedly examined for first-stage larvae to exclude the possibility of a pre-existing infection. The results of these experiments are set out in Table 1.

The prepatent period, that is, the interval between feeding infective material and the appearance of first-stage larvae in the faeces, was between six and seven weeks.

### SUMMARY.

*Filostrongylus peramelis* n.g., n.sp., is described from the bronchioles of the bandicoots, *Isoodon obesulus* and *Perameles nasuta*.

Development of this parasite occurred in the slug, *Agriolimax laevis*, in about three weeks. Four clean bandicoots were infected, the prepatent period in them being between six and seven weeks.

### EXPLANATION OF PLATE VI.

Figure 1.—Section of lung of *Isoodon obesulus*, showing female worm coiled up near pleural surface, x 32.

Figures 2-4.—Three successive views of tail of male worm in right ventrolateral, ventral and left lateral aspects respectively, showing spicules, x 384.

